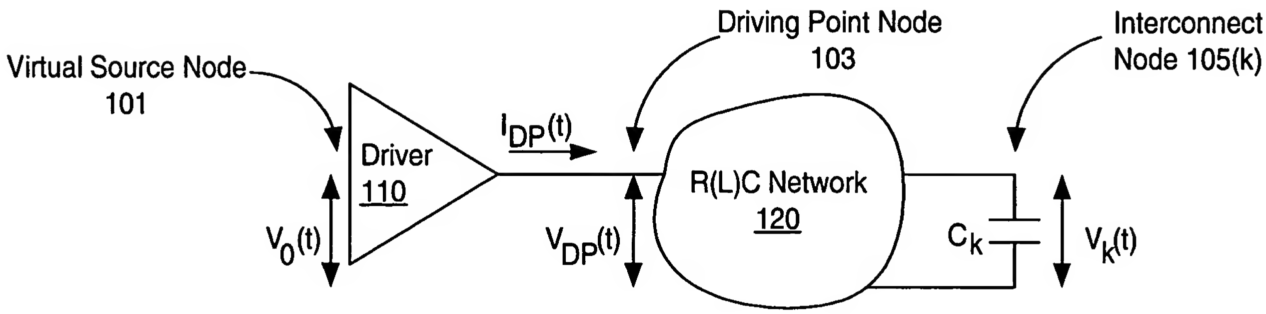

FIG. 1 - Prior Art

$$C_{eff} \cdot V(T) = \sum_{k=1}^{N} C_k \cdot V_k(T) \qquad \text{Eq. 1}$$

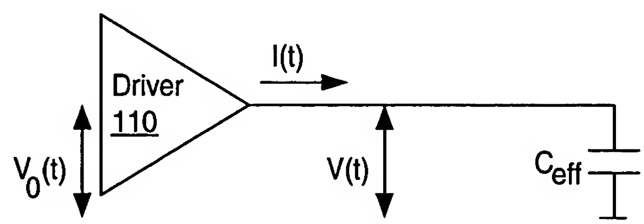

FIG. 2 - Prior Art

$$C_{eff} = \sum_{k=1}^{N} C_k \cdot \frac{V_k(T)}{V_{DP}(T)} \qquad \text{Eq. 2}$$

FIG. 3

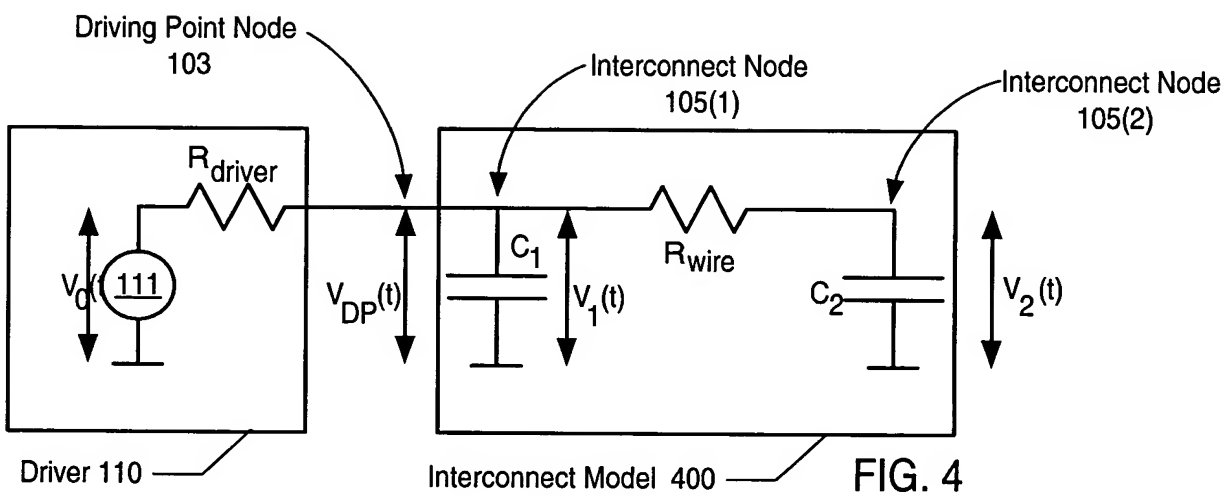
Driving Point Node
103
Interconnect Node
105(1)
Interconnect Node
105(2)
Rdriver
111
V0(t)
VDP(t)
C1
V1(t)
Rwire
C2
V2(t)
Driver 110
Interconnect Model 400

FIG. 4

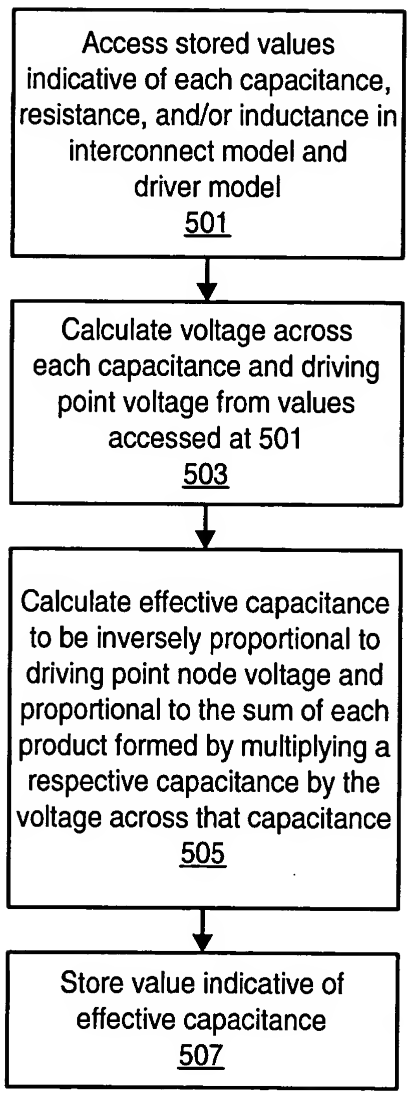
Access stored values indicative of each capacitance, resistance, and/or inductance in interconnect model and driver model
501
Calculate voltage across each capacitance and driving point voltage from values accessed at 501
503
Calculate effective capacitance to be inversely proportional to driving point node voltage and proportional to the sum of each product formed by multiplying a respective capacitance by the voltage across that capacitance
505
Store value indicative of effective capacitance
507

FIG. 5A

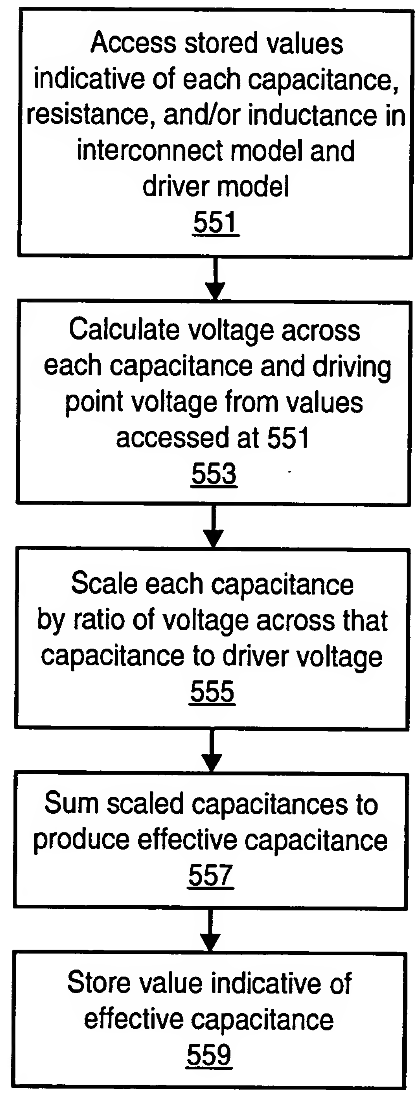
Access stored values indicative of each capacitance, resistance, and/or inductance in interconnect model and driver model
551
Calculate voltage across each capacitance and driving point voltage from values accessed at 551
553
Scale each capacitance by ratio of voltage across that capacitance to driver voltage
555
Sum scaled capacitances to produce effective capacitance
557
Store value indicative of effective capacitance
559

FIG. 5B

Eqs. 3 $T_{11} = R_{driver} \cdot C1 \qquad T_{12} = R_{driver} \cdot C2 \qquad T_{22} = R_{wire} \cdot C2$

Eqs. 4 $T_{Elmore} = T_{11} + T_{12} + T_{22} \qquad T_{Root} = \sqrt{T_{Elmore} - 4 \cdot T_{11} \cdot T_{22}}$

Eqs. 5 $$s_{1,2} = \frac{\pm T_{Root} - T_{Elmore}}{2 \cdot T_{11} \cdot T_{22}}$$

Eqs. 6
$$\tau_1^1 = -\frac{1 + s_1 \cdot T_{22}}{T_{Root} \cdot s_1^2} \qquad \tau_2^1 = \frac{1 + s_2 \cdot T_{22}}{T_{Root} \cdot s_2^2}$$
$$\tau_1^2 = -\frac{1}{T_{Root} \cdot s_1^2} \qquad \tau_2^2 = \frac{1}{T_{Root} \cdot s_2^2}$$

Eqs. 7
$$V_1(t) = \begin{cases} 0 & t < 0 \\ \frac{1}{T} \cdot \left(t + \tau_1^1(1 - \exp(s_1 t)) + \tau_2^1(1 - \exp(s_2 t))\right) & 0 \le t \le T \\ 1 + \frac{1}{T} \cdot \left(\tau_1^1(1 - \exp(s_1 T))\exp(s_1(t - T)) + \tau_2^1(1 - \exp(s_2 t))\exp(s_2(t - T))\right) & T < t \end{cases}$$
$$V_2(t) = \begin{cases} 0 & t < 0 \\ \frac{1}{T} \cdot \left(t + \tau_1^2(1 - \exp(s_1 t)) + \tau_2^2(1 - \exp(s_2 t))\right) & 0 \le t \le T \\ 1 + \frac{1}{T} \cdot \left(\tau_1^2(1 - \exp(s_1 T))\exp(s_1(t - T)) + \tau_2^2(1 - \exp(s_2 t))\exp(s_2(t - T))\right) & T < t \end{cases}$$

Eq. 8 $$Ceff = C1 + C2 \cdot \frac{V_2(T)}{V_1(T)}$$

Eq. 9 $$Ceff = C1 + C2 \cdot \frac{T + \tau_1^2(1 - \exp(s_1 T)) + \tau_2^2(1 - \exp(s_2 T))}{T + \tau_1^1(1 - \exp(s_1 T)) + \tau_2^1(1 - \exp(s_2 T))}$$

FIG. 6

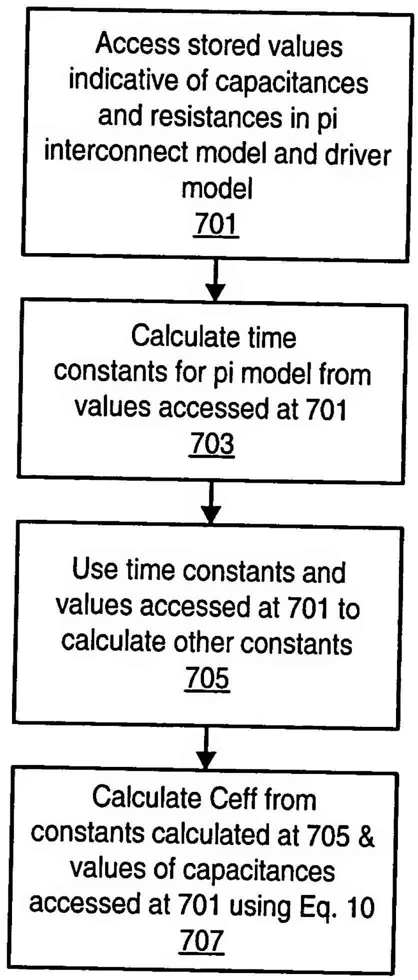
Access stored values indicative of capacitances and resistances in pi interconnect model and driver model
701
Calculate time constants for pi model from values accessed at 701
703
Use time constants and values accessed at 701 to calculate other constants
705
Calculate Ceff from constants calculated at 705 & values of capacitances accessed at 701 using Eq. 10
707

FIG. 7

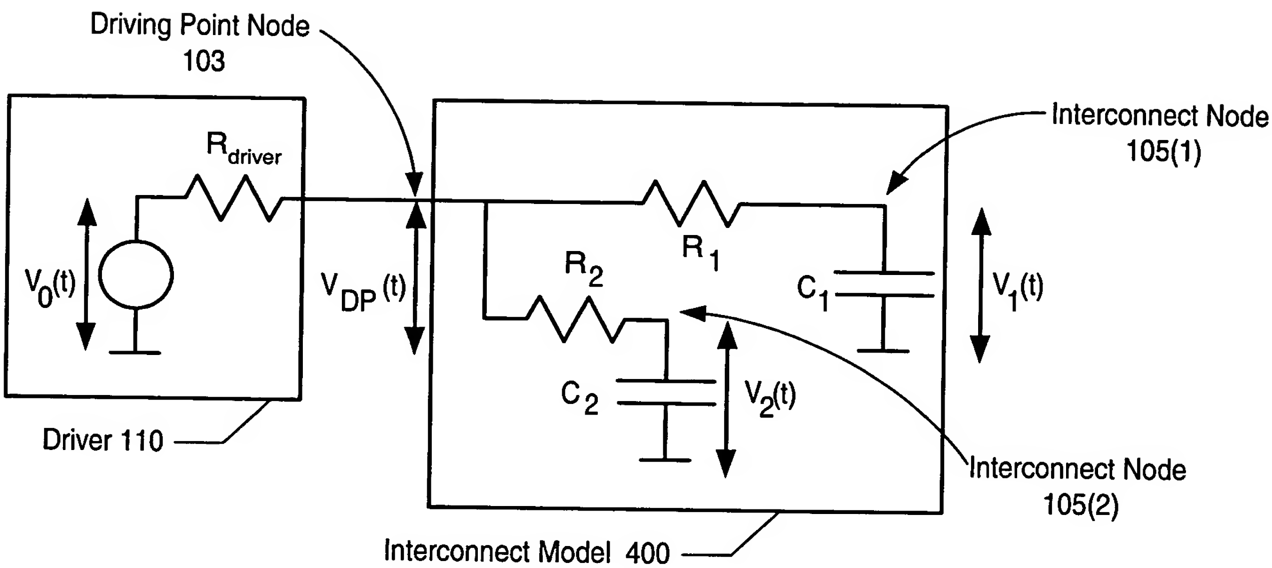
Driving Point Node 103
R_{driver}
$V_0(t)$
$V_{DP}(t)$
R_1
R_2
C_1
$V_1(t)$
C_2
$V_2(t)$
Interconnect Node 105(1)
Interconnect Node 105(2)
Driver 110
Interconnect Model 400

FIG. 8

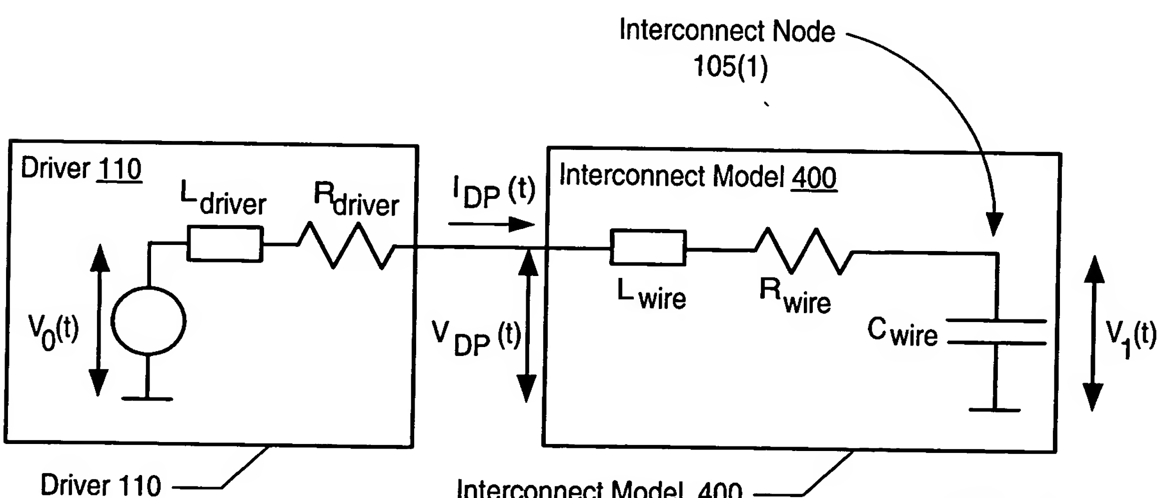
Interconnect Node 105(1)
Driver 110
L_{driver}
R_{driver}
$I_{DP}(t)$
Interconnect Model 400
$V_0(t)$
$V_{DP}(t)$
L_{wire}
R_{wire}
C_{wire}
$V_1(t)$
Driver 110
Interconnect Model 400

FIG. 9

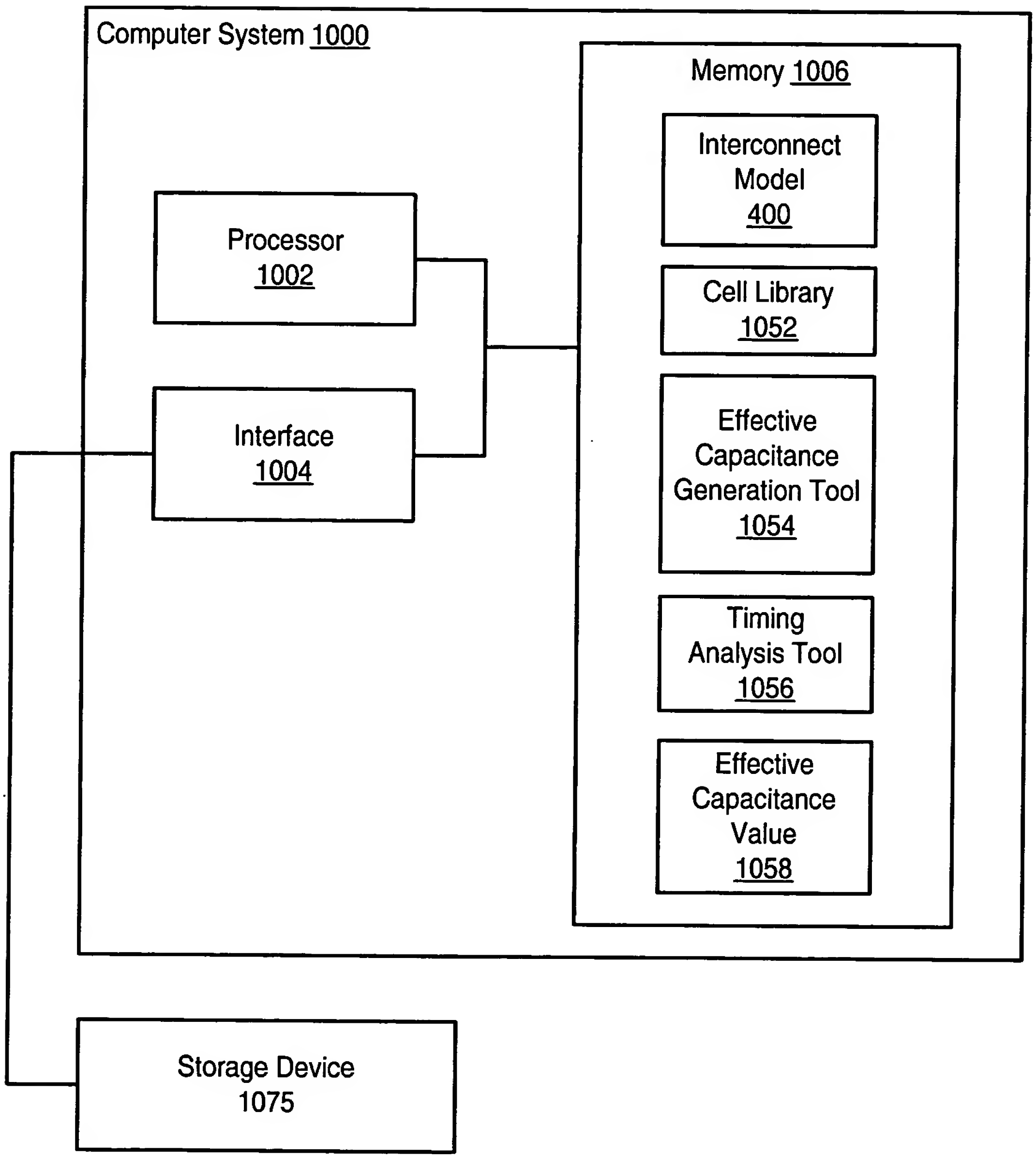
Computer System 1000
Processor 1002
Interface 1004
Memory 1006
Interconnect Model 400
Cell Library 1052
Effective Capacitance Generation Tool 1054
Timing Analysis Tool 1056
Effective Capacitance Value 1058
Storage Device 1075

FIG. 10